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Host preference of *Araecerus fasciculatus* (DeGeer) (Coleoptera: Anthribidae): Adult presence and oviposition on twelve maize varieties

Preferensi inang *Araecerus fasciculatus* (DeGeer) (Coleoptera: Anthribidae): Kehadiran imago dan oviposisi pada dua belas varietas jagung

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ABSTRACT

The coffee bean weevil, *Araecerus fasciculatus* (DeGeer) (Coleoptera: Anthribidae), is a significant polyphagous stored product pest known to cause severe damage, including perforation and hollowing, in stored maize. This study aimed to determine the adult presence and oviposition preference of *A. fasciculatus* across twelve commercial maize varieties, and to analyze the correlation between preference and specific grain characteristics. The free choice test method (FCTM) was employed using preference cages with 12 or 6 chambers. In each test, 30 g of maize were infested with 60 pairs of 7- to 14-day-old *A. fasciculatus* adults for seven days. Adult presence (total and by sex) was recorded daily, and the number of eggs laid was counted microscopically at the end of the infestation period. The composition of maize varieties significantly affected adult presence and oviposition. Results consistently showed that the Pertiwi 3 variety was the most highly preferred for both adult presence (21.86 individuals in the 12-variety test) and oviposition (22.75 eggs in the 12-variety test). This high preference was supported by the Perkasa variety (e.g., 13.54 adults), which was also consistently preferred across the different test compositions. Further analysis using the generalized linear model (GLM) indicated that the preference is driven by grain quality: adult presence showed a positive correlation with moisture content, while oviposition exhibited a negative correlation with phenol content. These findings suggest that the Pertiwi 3 variety, likely due to its favorable physical attributes and low levels of chemical defense, is the most susceptible to *A. fasciculatus* infestation.

Key words: adult presence, maize, oviposition preference

ABSTRAK

Araecerus fasciculatus (DeGeer) (Coleoptera: Anthribidae) merupakan hama polifag pada produk simpanan yang diketahui menyebabkan kerusakan parah, termasuk perforasi dan rongga, pada jagung yang disimpan. Penelitian ini bertujuan untuk menentukan preferensi kehadiran imago dan oviposisi *A. fasciculatus* pada dua belas varietas jagung komersial, serta menganalisis korelasi antara preferensi dan karakteristik biji jagung dari setiap varietas. Metode uji pilihan bebas (*free choice test method*, FCTM) digunakan di dalam sangkar preferensi dengan 12 atau 6 bilik. Dalam setiap uji, 30 g jagung diinfestasi dengan 60 pasang imago *A. fasciculatus* (umur 7–14 hari) selama tujuh hari. Kehadiran imago (total dan berdasarkan jenis kelamin) diamati setiap hari, dan jumlah telur yang diletakkan dihitung dengan menggunakan mikroskop pada akhir periode infestasi. Komposisi varietas jagung secara signifikan memengaruhi kehadiran imago dan oviposisi. Hasil secara konsisten menunjukkan bahwa varietas Pertiwi 3 paling disukai untuk kehadiran imago (21,86 individu dalam uji 12-varietas) dan oviposisi (22,75 telur dalam uji 12-varietas). Preferensi tinggi ini juga didukung oleh varietas Perkasa (13,54 imago), yang juga disukai secara konsisten di berbagai komposisi uji. Analisis lanjutan menggunakan *generalized linear model* (GLM) mengindikasikan bahwa preferensi ini didorong oleh kualitas biji: kehadiran imago menunjukkan korelasi positif dengan kandungan air, sedangkan oviposisi menunjukkan korelasi negatif dengan kandungan fenol. Temuan ini menunjukkan bahwa varietas Pertiwi 3, kemungkinan karena kombinasi sifat fisik yang menguntungkan dan tingkat pertahanan kimiawi yang rendah, adalah yang paling rentan terhadap infestasi *A. fasciculatus*.

Kata kunci: jagung, kehadiran imago, preferensi oviposisi

INTRODUCTION

Maize (*Zea mays* L.) is globally one of the most vital cereal crops (Shah et al. 2016). In Indonesia, its utility is diverse, serving as a primary food source (Sulaiman et al. 2018), industrial raw material, cattle feed, and a component of the bioindustry (Sulaiman et al. 2018; Fiqriansyah et al. 2021). In addition, maize is also high in carbohydrates and contains various nutrients, so it is considered a potential rice substitute (Nadhifa 2025). The extensive utilization of this crop has spurred the development of numerous varieties, leading to significant increases in production yields. Indonesia's production grew by 0.43 million tons between 2023 and 2024 (BPS 2024), utilizing popular varieties such as Bisi 2, BTS 5, Bisma, Lamuru, Perkasa, Pertiwi 3, and others. As production volumes rise, effective post-harvest management is crucial to maintain the quality and quantity of stored maize.

A major threat to stored maize quality is infestation by the coffee bean weevil, *Araecerus fasciculatus* (DeGeer) (Hill 2002; Hagstrum et al. 2013). This insect is highly polyphagous (Kumar & Ray 2022) and cosmopolitan (Alba-Alejandre et al. 2018), distributed widely in tropical and subtropical regions. *Araecerus fasciculatus* is known to damage a broad array of stored commodities, including coffee, cassava, peanuts, dried and fresh fruits, and various medicinal materials. The damage inflicted by this pest is severe, resulting in perforations and hollowing of the diet (Rees 2004). For instance, previous studies have documented yield reductions of up to 39.87% in coffee beans and 91.51% in dried cassava due to *A. fasciculatus* attack (Solomon 2002; Wahyuni et al. 2022).

The extent of damage caused by stored product pests is intrinsically linked to the inherent physical and chemical properties of the stored material. These properties vary among maize varieties and can profoundly influence insect behavior, particularly their host preference. Differences in grain characteristics affect insect activities such as adult aggregation, feeding, and oviposition site selection. However, limited information is currently available regarding the specific preferences of *A. fasciculatus* for various maize varieties concerning their physical and chemical profiles. Gaining this insight is critical for identifying vulnerable varieties and developing targeted management strategies. Therefore, this study aimed to determine the adult presence and oviposition preference of *A. fasciculatus* among twelve maize varieties using the free choice test method (FCTM), and to analyze the correlation between maize grain characteristics (specifically moisture and phenol content) and these preference indices.

MATERIALS AND METHODS

Study sites and experimental design

This research was conducted from November 2024 to April 2025 at the Plant Pest Laboratory, Department of Plant Pests and Diseases, Faculty of Agriculture, Universitas Brawijaya (UB). The experimental design was used a completely randomized design (CRD) with twelve treatments (maize varieties) and four replication. The maize varieties tested were: Bisi 2, BTS 5, Bisma, Lamuru, Perkasa, Nusa 01, Nusa 03, Pertiwi 3, Sukmaraga, Bima 20 URI, Bima 14 Batara, and Srikandi Kuning.

Insect rearing and diet preparation

Insect rearing. The coffee bean weevil, *A. fasciculatus*, specimens were obtained from the established insect collection at the Plant Pest Laboratory, UB. The insects were reared using a modified method based on Novo & Baptista (1998) and Atikah et al. (2022). Five hundred grams (500 g) of dried cassava were placed into a rearing box (16 cm × 16 cm × 10 cm). Two hundred (200) unsexed *A. fasciculatus* adults were introduced into the box for seven days for oviposition. After this period, the adults were removed, and the infested diet was maintained in the box until the F1 progeny emerged. The adult *A. fasciculatus* used for the preference test were aged 1–2 weeks old (Novo & Baptista 1998).

Diet sterilization. All diets used in the study, dried cassava for rearing and the twelve maize varieties for the treatments, were heat-sterilized to prevent contamination (Pratiwi & Ananda 2020). The diets were placed in trays (29 cm × 21 cm × 4.5 cm) and heated in an oven at 40 °C for four hours. After sterilization, the diets were removed and allowed to cool at room temperature for at least 24 hours prior to use in the experiment.

Maize grain analysis. To characterize the experimental diets, both physical and chemical analyses were conducted on twelve maize varieties. Physical characterization, specifically grain hardness, was measured at the Laboratory of Agricultural Food Technology, Faculty of Agricultural Technology, Universitas Gadjah Mada (UGM), Yogyakarta. Chemical profiling included the determination of total phenolic content and proximate composition. The phenolic analysis was performed at the Plant Pest Laboratory, Department of Plant Pests and Diseases, Universitas Brawijaya, Malang, while proximate analysis was carried out at the Chemistry Laboratory, Balai Pengujian dan Sertifikasi Mutu Barang (BPSMB), Malang, to determine moisture, ash, crude protein, lipid, and carbohydrate contents.

The results demonstrate that these maize varieties possess distinct physical and chemical profiles (Table 1). Grain hardness varied substantially, ranging from 379.95 N to 866.10 N. Regarding chemical composition, phenol contents fluctuated between 6.09 ppm and 9.46 ppm, and protein levels ranged from 4.59% to 8.02%. Furthermore, carbohydrate levels remained consistently high across all varieties (73.94%–79.82%), indicating that the selected varieties differ markedly in both their structural integrity and specific nutrient concentrations.

Preference test using the free choice test method

The host preference of *A. fasciculatus* was evaluated using the free choice test method (FCTM) within custom-made, transparent glass preference cages (± 3 mm thick) equipped with internal glass partitions to create separate chambers. The study employed two types of cages: one with twelve chambers (Figure 1A) and two separate units with six chambers each (Figure 1B). The experiments using the twelve-chamber and six-chamber configurations were conducted to verify the consistency of adult presence across different variety compositions. The twelve maize varieties were randomly assigned to these three test compositions: a single 12-variety test (all twelve varieties tested simultaneously), a first six-variety test (comprising Bisi 2, Bisma, Perkasa, Nusa 01, Sukmaraga, and Bima 20 URI), and a second six-variety test (comprising BTS 5, Lamuru, Nusa 03, Pertiwi 3, Bima 14 Batara, and Srikandi Kuning).

For each test, thirty grams (30 g) of the respective maize variety were placed into each chamber of the preference cage (Chijindu & Boateng 2008). Infestation was initiated by introducing sixty pairs (120 individuals) of 7- to 14-day-old *A. fasciculatus* adults into the center of the cage (Chijindu 2002). The cages were then sealed with a modified lid and covered with cloth. The number of adults present in each variety chamber was recorded daily for a total of seven days. The final count at 7 days after infestation (DAI) was recorded both as the total number of individuals and as a percentage to analyze trends across the different test compositions. On the

Table 1. Physical (hardness) and chemical (phenol and proximate) characteristics of twelve maize varieties

Maize varieties	Hardness (N)	Phenol (ppm)	Protein (%)	Lipid (%)	Moisture (%)	Ash (%)	Carbohydrate (%)
Bisi 2	551.06	9.46	6.72	4.47	13.53	1.34	73.94
BTS 5	560.55	7.89	6.48	4.45	8.27	1.33	79.46
Bisma	797.29	9.44	6.56	5.15	7.87	1.69	78.72
Lamuru	586.20	9.46	6.59	4.13	7.94	1.53	79.82
Perkasa	379.95	9.45	6.41	4.42	11.92	1.13	76.12
Nusa 01	440.48	6.56	6.72	4.16	9.46	1.59	78.06
Nusa 03	866.10	8.76	5.90	4.38	10.17	1.45	78.10
Pertiwi 3	670.72	6.09	4.59	4.03	12.59	1.22	77.57
Sukmaraga	467.31	7.94	6.78	3.84	8.88	1.41	79.09
Bima 20 URI	640.73	8.77	5.87	4.25	8.99	1.46	79.44
Bima 14 Batara	400.33	8.82	7.88	3.40	10.43	1.40	76.90
Srikandi Kuning	859.40	9.01	8.02	4.05	8.81	1.49	77.63

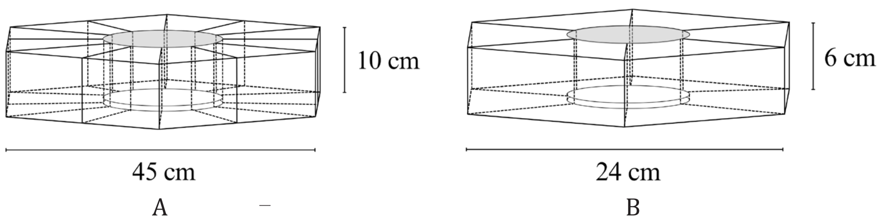

Figure 1. Preference cage. A: 12 chambers and B: 6 chambers.

seventh day, the adults were removed, and a final count was conducted, distinguishing between males and females for sex ratio determination. Following adult removal, the maize seeds were immediately inspected under a microscope to determine the number of eggs laid in each maize variety, thereby assessing the oviposition preference.

Data analysis

All data were analyzed using analysis of variance (ANOVA) at a 5% significance level. If the ANOVA indicated a significant difference between treatments, further analysis was conducted using Duncan's multiple range test (DMRT) at a 5% error level. A generalized linear model (GLM) was employed to examine the relationship between the physical and chemical characteristics of the maize (e.g., moisture and phenol content) and the preference indices (adult presence and oviposition). All analyses were performed using R Statistics software, version 4.3.2 (R Core Team 2023).

The index of dispersion (ID) was used to determine the distribution pattern of the *A. fasciculatus* adults within the preference test chambers (Arbab & Bakry 2016). The formula used for the ID calculation is:

$$ID = \frac{S^2}{\bar{x}}$$

where S^2 is the sample variance and $\bar{x}$ is the mean of the population. The distribution patterns are categorized as: uniform (ID < 1), random (ID = 1) and clumped (ID > 1).

RESULTS

Adult presence and preference of *A. fasciculatus*

Total adult presence. The composition of maize varieties significantly influenced the total presence of *A. fasciculatus* adults across all preference tests conducted over the seven-day infestation period (12-variety test: F = 8.93, P < 0.001; first six varieties: F = 33.88, P < 0.001; second six varieties: F = 134.60, P < 0.001). In the 12-variety preference test, the Pertiwi 3 variety (21.86 individuals) was the most preferred by *A. fasciculatus* adults, followed by Bisi 2 (14.22 individuals) and Perkasa (13.54 individuals) (Table 2). When tested in combinations of six, the adults showed an even stronger preference for certain varieties. In the first six-variety test, adults preferred Perkasa (30.29 individuals) and Pertiwi 3 (49.79 individuals) significantly more than the other four varieties (Tables 3 and 4). These combined results demonstrate that *A. fasciculatus* adults consistently favored Pertiwi 3 and Perkasa when presented with different combinations of maize varieties. The distribution pattern of the adults across the chambers was determined to be clumped in all three preference tests, as indicated by the index of dispersion (ID) values (12 varieties: ID = 2.47; first six varieties: ID = 2.12; second six varieties: ID = 9.62). Furthermore, a generalized linear model (GLM) analysis revealed a positive correlation between the moisture content of the maize and the total adult presence (Estimate = 1.475; P = 0.001) (Table 5).

Presence by sex and sex ratio. An analysis of variance confirmed that the maize variety composition significantly affected the presence of both males and females at 7 DAI across all tests. In the 12-variety test, both male and female *A. fasciculatus* preferred the Pertiwi 3 variety (males: 10.75 individuals; females: 10.50 individuals), followed by the Perkasa variety (males: 6.00 individuals; females: 7.25 individuals) (Table 2). Similarly, in the first six-variety test, both sexes showed a higher preference for Perkasa (males: 14.50; females: 13.75 individuals) and Pertiwi 3 (males: 24.00; females: 25.50 individuals) over the other varieties (Tables 3 and 4). Regarding distribution, the index of dispersion showed a clumped distribution pattern for both males and females in the 12-variety and second six-variety tests. The only exception was the females in the first six-variety test, which showed a uniform distribution pattern (ID = 0.75). GLM analysis further revealed a positive correlation between moisture content and the presence of both males (Estimate = 0.577; P = 0.012) and females (Estimate = 0.507; P = 0.039) (Table 5).

The sex ratio of *A. fasciculatus* adults varied across the preference tests. In the preference test of the twelve varieties of maize, the sex ratio of *A. fasciculatus* ranged from 1:0.60 to 1:1.36 (Table 2). The preference test on the first six varieties of maize showed that the sex ratio of *A. fasciculatus* ranged from 1:0.95 to 1:1.31 (Table 3). In the preference test of the second six varieties of maize, the sex ratio ranged from 1:0.63 to 1:1.06 (Table 4).

Oviposition preference of *A. fasciculatus*

The effect of maize variety composition on the number of eggs laid was significant in the 12-variety test (F = 7.98, P < 0.001) but not significant in the first six-variety test (F = 1.03, P < 0.001). However, the effect was significant again in the second six-variety test (F = 15.06, P < 0.001). Consistent with the adult presence results, the Pertiwi 3 variety received the highest number of eggs in both the 12-variety test (22.75 eggs) and the second six-variety test (45.00 eggs) (Tables 2 and 4). These findings confirm that females consistently chose Pertiwi 3 as the preferred variety for egg-laying across the tests where significant differences were detected. The distribution of eggs was clumped in the first six-

Table 2. Adult presence of *Araecerus fasciculatus* during 7 days after infestation (DAI) and at 7 DAI on the 12 varieties of maize

Maize varieties	Adult presence during 7 DAI		Adult presence at 7 DAI		Sex ratio (M:F)	Number of egg (Eggs) (x̄ ± SD)
	Individuals (x̄ ± SD)	% (x̄ ± SD)	Male (Individuals) (x̄ ± SD)	Female (Individuals) (x̄ ± SD)		
Bisi 2	14.22 ± 2.83 b	11.85 ± 2.36 b	6.75 ± 0.96 ab	6.00 ± 1.41 bc	1:0.89	7.25 ± 2.06 b
Bisma	9.00 ± 1.29 cd	7.50 ± 1.08 cd	4.25 ± 0.96 bcd	4.75 ± 1.50 bcd	1:1.12	8.00 ± 4.83 b
Perkasa	13.54 ± 4.54 bc	11.28 ± 3.78 bc	6.00 ± 1.83 abc	7.25 ± 3.50 ab	1:1.21	10.25 ± 4.57 b
Nusa 01	8.11 ± 1.04 de	6.76 ± 0.87 de	4.00 ± 1.15 bcd	5.00 ± 1.41 bcd	1:1.25	6.00 ± 4.08 bc
Sukmaraga	8.25 ± 2.06 de	6.88 ± 1.71 de	4.50 ± 0.58 bcd	4.50 ± 2.52 bcd	1:1.00	5.00 ± 2.16 bc
Bima 20 URI	7.64 ± 2.37 de	6.37 ± 1.97 de	2.75 ± 1.71 d	3.75 ± 1.26 cde	1:1.36	5.25 ± 1.50 bc
BTS 5	7.22 ± 1.13 de	6.01 ± 0.94 de	4.50 ± 1.29 bcd	3.50 ± 0.58 cde	1:0.78	2.75 ± 1.26 cd
Lamuru	7.61 ± 1.26 de	6.34 ± 1.05 de	4.00 ± 0.82 bcd	5.00 ± 0.82 bcd	1:1.25	7.25 ± 2.63 b
Nusa 03	5.89 ± 1.74 e	4.91 ± 1.45 e	3.75 ± 2.22 cd	2.25 ± 0.96 e	1:0.60	1.50 ± 0.58 d
Pertiwi 3	21.86 ± 5.99 a	18.22 ± 4.99 a	10.75 ± 3.59 a	10.50 ± 2.52 a	1:0.98	22.75 ± 11.00 a
Bima 14 Batara	9.50 ± 2.53 cd	7.92 ± 2.11 cd	4.25 ± 1.71 bcd	4.50 ± 1.91 bcd	1:1.06	5.50 ± 1.73 bc
Srikandi Kuning	7.22 ± 1.08 de	6.02 ± 0.90 de	4.50 ± 1.29 bcd	3.00 ± 1.41 de	1:0.67	3.00 ± 3.37 d

Numbers followed by the same letter in the same column are not significantly different at P < 0.05. Individuals: total number of adults recorded per variety; %: proportion of adults per variety relative to the total population.

Table 3. Adult presence of *Araecerus fasciculatus* during 7 days after infestation (DAI) and at 7 DAI on the first 6 varieties of maize

Maize varieties	Adult presence during 7 DAI		Adult presence at 7 DAI		Sex ratio (M:F)	Number of egg (Eggs) (x̄ ± SD)
	Individuals (x̄ ± SD)	% (x̄ ± SD)	Male (Individuals) (x̄ ± SD)	Female (Individuals) (x̄ ± SD)		
Bisi 2	22.61 ± 2.28 b	18.84 ± 1.90 b	10.50 ± 1.29 bc	11.00 ± 2.16 abc	1:1.05	14.75 ± 10.47 a
Bisma	14.22 ± 3.13 c	11.84 ± 2.60 c	6.50 ± 1.73 d	8.50 ± 1.29 bc	1:1.31	12.25 ± 2.99 a
Perkasa	30.29 ± 1.20 a	25.24 ± 1.00 a	14.50 ± 2.38 a	13.75 ± 2.36 a	1:0.95	18.75 ± 7.46 a
Nusa 01	15.07 ± 2.26 c	12.56 ± 1.88 c	7.75 ± 1.71 cd	9.75 ± 2.36 bc	1:1.26	10.50 ± 5.20 a
Sukmaraga	14.04 ± 2.53 c	11.70 ± 2.11 c	7.25 ± 1.71 d	7.75 ± 2.62 c	1:1.07	12.75 ± 4.03 a
Bima 20 URI	23.79 ± 1.81 b	19.82 ± 1.51 b	11.25 ± 2.50 b	11.50 ± 1.91 ab	1:1.02	16.00 ± 3.56 a

Numbers followed by the same letter in the same column are not significantly different at P < 0.05. Individuals: total number of adults recorded per variety; %: proportion of adults per variety relative to the total population.

Table 4. Adult presence of *Araecerus fasciculatus* during 7 days after infestation (DAI) and at 7 DAI on the second 6 varieties of maize

Maize varieties	Adult presence during 7 DAI		Adult presence at 7 DAI		Sex ratio (M:F)	Number of egg (Eggs) (x̄ ± SD)
	Individuals (x̄ ± SD)	% (x̄ ± SD)	Male (Individuals) (x̄ ± SD)	Female (Individuals) (x̄ ± SD)		
BTS 5	13.29 ± 0.35 c	11.08 ± 0.29 c	7.25 ± 2.06 b	7.00 ± 0.82 b	1:0.97	7.50 ± 2.08 bc
Lamuru	16.29 ± 1.42 b	13.57 ± 1.19 b	8.25 ± 3.30 b	8.25 ± 1.26 b	1:1.00	11.00 ± 3.74 b
Nusa 03	11.96 ± 1.03 cd	9.97 ± 0.85 cd	6.75 ± 2.06 b	5.00 ± 0.82 cd	1:0.74	4.00 ± 2.16 c
Pertiwi 3	49.79 ± 2.37 a	41.49 ± 1.97 a	24.00 ± 1.83 a	25.50 ± 3.11 a	1:1.06	45.00 ± 14.85 a
Bima 14 Batara	17.43 ± 2.68 b	14.52 ± 2.24 b	10.25 ± 2.50 b	6.75 ± 2.06 bc	1:0.66	13.00 ± 7.16 b
Srikandi Kuning	11.25 ± 1.07 d	9.38 ± 0.89 d	6.75 ± 1.26 b	4.25 ± 0.97 d	1:0.63	5.00 ± 3.37 c

Numbers followed by the same letter in the same column are not significantly different at P < 0.05. Individuals: total number of adults recorded per variety; %: proportion of adults per variety relative to the total population.

Table 5. The results of the GLM analysis between the analysis of seed hardness, phenol, and proximate of various maize varieties with the research variables

Variable	Adult presence during 7 DAI			Adult presence at 7 DAI: Male presence			Adult presence at 7 DAI: Female presence			Number of eggs		
	Est	SE	P	Est	SE	P	Est	SE	P	Est	SE	P
(Intercept)	10.698	11.896	0.374	7.509	6.562	0.259	9.165	7.147	0.207	25.118	18.443	0.181
Phenol	-0.821	0.638	0.205	-0.725	0.352	0.046*	-0.362	0.383	0.350	-0.887	0.989	0.375
Hardness	-0.001	0.004	0.972	0.003	0.002	0.232	-0.003	0.002	0.166	-0.002	0.006	0.767
Protein	-1.024	0.922	0.273	-0.045	0.509	0.929	-0.822	0.554	0.146	-2.908	1.429	0.048*
Lipid	0.748	1.734	0.669	0.594	0.957	0.538	0.426	1.042	0.685	-0.532	2.689	0.844
Ash	-3.327	5.551	0.552	-4.097	3.062	0.188	-0.439	3.335	0.896	0.892	8.606	0.918
Moisture	1.475	0.397	0.001***	0.577	0.219	0.012*	0.507	0.238	0.039*	1.060	0.615	0.093

DAI: day after infestation; Est: estimate; SE: standard error; P: P-Value *P < 0.05; **P < 0.01; ***P < 0,001.

variety test (ID = 2.66) and the second six-variety test (ID = 17.37). However, the 12-variety test showed a uniform distribution pattern for oviposition. Finally, GLM analysis identified a negative correlation between the phenol content of the maize grain and the number of eggs laid (Estimate = -2.908; P = 0.048) (Table 5).

DISCUSSIONS

The preference of an insect for a specific host is fundamentally indicated by its consistent feeding and oviposition activities (Schoonhoven et al. 2005). In this study, the implementation of 12-variety and two 6-variety preference tests served to assess the consistency of host selection by *A. fasciculatus* adults across varying choices. The results strongly demonstrated that *A. fasciculatus* consistently preferred the Pertiwi 3 variety, and to a lesser extent, Perkasa, regardless of the other varieties present in the preference cage. This consistent choice suggests that the preference behavior of *A. fasciculatus* is driven by specific, inherent characteristics of the preferred maize varieties, which can be categorized into physical and chemical dietary factors (Manueke & Palealu 2015). The consistently clumped distribution pattern observed for adults in most tests further affirms that the insects actively aggregated toward the preferred varieties rather than dispersing randomly.

The physical characteristics of the maize grain appear to play a critical role in facilitating infestation and oviposition. Pertiwi 3 is hypothesized to possess a kernel type with a softer endosperm, which increases its susceptibility to post-harvest pests compared to other varieties (Suleiman et al. 2015). Softer kernels mechanically ease the process of feeding and, critically, allow females to penetrate the seed coat with their ovipositors for egg deposition. This mechanism is consistent with reports showing that *A. fasciculatus* females more readily lay eggs in softer substrates, such as the dried cassava tips (Salbiah et al. 2022), mindi fruit pulp (Kumar & Ray 2022), and softer parts of the coffee bean (Alba-Alejandre et al. 2018). Conversely, maize varieties with higher kernel hardness can act as a mechanical resistance, significantly reducing both feeding and colonization activities (Ngom et al. 2020).

Beyond physical attributes, the chemical characteristics of the maize varieties significantly influenced the adult presence and reproductive behavior of *A. fasciculatus*. Our generalized linear model (GLM) analysis established a positive correlation between the moisture content of the maize and the number of adults present. This aligns with prior findings that elevated moisture levels enhance the suitability of the diet, potentially increasing feeding activity, survivorship, and overall pest population growth in infested diets (Astuti 2019). Studies have specifically highlighted that *A. fasciculatus* tends to prefer hosts with higher moisture content, such as peanuts (Hasby 2023).

Furthermore, the oviposition preference was distinctly modulated by the host's defensive chemistry. The GLM analysis revealed a negative correlation between the phenol content and the number of eggs laid. Phenol compounds function as a natural plant defense mechanism against phytophagous insects (Schowalter 2011). The females of *A. fasciculatus* preferentially chose to lay eggs in varieties with lower phenol levels, such as Pertiwi 3 (which possesses low phenol and protein content, see Table 5), thereby minimizing chemical toxicity exposure for their developing offspring. This behavior is a crucial adaptive strategy, ensuring that progeny develop successfully on an ideal diet (Arotolu et al. 2018; Hasby 2023). Although the sex ratio of the adults varied across tests, the consistent findings regarding both adult aggregation and egg-laying on the Pertiwi 3 variety ultimately confirm that its combination of favorable physical properties (soft kernel) and low levels of chemical defenses (low phenol) makes it highly susceptible to *A. fasciculatus* infestation.

CONCLUSIONS

The free choice test method (FCTM) successfully determined the host preference of *A. fasciculatus* among the twelve maize varieties tested. The results consistently demonstrated that the Pertiwi 3 variety was the most preferred by *A. fasciculatus* adults for both presence (infestation) and oviposition across the various test compositions. This strong preference is highly correlated with specific maize grain characteristics. Generalized linear model (GLM) analysis revealed that the adult presence of *A. fasciculatus* had a positive correlation with moisture content of the maize, while oviposition showed a negative correlation with phenol content. Consequently, the high preference for the Pertiwi 3 variety is attributable to its combination of favorable physical traits (hypothesized soft kernel) and low levels of chemical defenses (low phenol content), making it highly susceptible to infestation by *A. fasciculatus*.

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